

REMARKS

This Amendment is filed in response to the non-final Office Action of October 13, 2009 in which claims 1-43 were rejected.

I. Amendments

Drawings

Attached amended Fig. 1 has been provided with a legend “Prior Art” and labeled “Replacement Sheet” in the header, as requested in the Office Action.

Claims

Independent claims 1, 15, 29 and 43 have been restricted with the features of original claim 9, 23 and 37, respectively. The disclosure of the used expression “at least three frequency points” is covered e.g. by original claim 1, where “at least one” encompasses “at least three.” Further, paragraph [0036] of the published US patent application indicates an example for up to three frequency points, which may optionally be supplemented by additional frequency points.

In addition, it has been clarified in the independent claims that the employed complex allpass filter is a non-real complex allpass filter. The original disclosure can be found in the description of Figure 3, which presents a complex allpass filter, see e.g. paragraph [0053] of the published US patent application.

The term “optimally” has been cancelled in the independent claims for reasons of clarity (considering paragraph [0034] of the published US patent application).

The dependent claims have been adapted to the amended independent claims.

Claims 5-9, 19-23 and 33-37 have been cancelled.

Claims 15-28, originally directed at a signal processing device, have been amended to be directed at an apparatus. Paragraph [0037] of the published US patent application indicates that the invention can be employed for supporting a channel equalization in various types of devices, thus original support for the more general term apparatus is given.

Further, for the avoidance of doubt, it has been specified in claims 15 and 29 that at least one of the equalizer and the channel estimation component are implemented at least partly in hardware. The original support can be found in paragraph [0050] of the published US patent application, which states separately for both components that they can be implemented in hardware or software. For an implementation in software, it is further clear - e.g. from original claim 43 - that the implementation requires some (hardware) processing means in addition to software code.

Further, for the avoidance of doubt, claim 43 has been directed at a “computer readable medium” instead of a “software program product”. It is quite clear from the wording of the original claim that the expression “software program product” was used in the sense of “computer readable medium,” since the software program product was defined to store the software code and that this stored software code can be run in a signal processing device.

For reasons of clarity, the term “Method” in the method claims has been reformulated as “A method” and “The method,” etc. The other claims have been adapted accordingly. For reasons of clarity, the term “adapted to” in the apparatus and system claims has been amended to “configured to.”

II. Novelty and non-obviousness

Independent claim 1

New claim 1 has been restricted with the features of original claim 9 and some additional clarifications.

The examiner cites the following references for rejecting the independent claims and original claims 9, 23 and 37:

- Tapia et al. (US 5,555,285)
- Regalia et al. ("The Digital All-Pass Filter: A Versatile Signal Processing Building Block")

Tapia, which is considered as the main reference, does not disclose the combined use of an adjustable non-real complex allpass filter and an adjustable real allpass filter for an equalization of the phase of a channel. This was conceded by the examiner with reference to claim 9. Consequently amended claim 1 is new.

Compared to Tapia, the approach of claim 1 enables a channel equalization which can be realized with low complexity and provides at the same time a good performance.

As indicated in the application (paragraph [0035] of the published US patent application) "the computational complexity and power consumption depends on the complexity of the employed equalizer structure, which depends in turn on the number of the frequency points to be considered. Therefore, the number of frequency points is advantageously not fixed but determined individually for each channel, for example data block-wise based on the frequency domain channel estimates. This allows to use always the simplest equalizer structure providing a sufficient performance."

The method of claim 1 provides a good performance for channel equalization when using three frequency points, for which the method is defined. In addition, an implementation of this method enables an easy adaptation for the case that less than three frequency points are to be considered. For two frequency points, simply the real-pass allpass filtering could be omitted, while for one frequency point, only the phase rotation part might be used.

It is to be understood that there is no intention to interpret the claim with features that are not included in the claims. The method is provided specifically for three frequency points as defined. The cases of one and two frequency points are only mentioned to show the advantage of the flexible approach that is enabled by the method as defined.

Even if the examiner should consider single features of the method of pending claim 1 to be known from the prior art references, a skilled person would not combine the actions as defined in claim 1 without inventive considerations.

Neither Tapia nor Regalia provides any hint at such a combination.

It is stated in Regalis “*If we lift the restriction that $A(z)$ be a real function, then $A(z)$ takes the more general form ...*” and function $A(z)$ in equation (2.6) “*is recognized as a complex all-pass function*”. Thus, Regalis clearly presents two alternatives for defining an all-pass function. That is, Regalis only presents a transfer function $A(z)$ that may be either a real all-pass filter function or a complex all-pass filter function. Consequently, it does not disclose the combination of both types of filters as required by claim 1 to achieve the advantages indicated above and as missing in Tapia.

On the whole, it becomes apparent that claim 1 is neither anticipated nor rendered obvious by the cited references.

The same applies to the **other independent claims**, which comprise corresponding features, and consequently to the **dependent claims** as well for at least the same reasons. Withdrawal of the novelty rejection of section 3 and the various obviousness rejections of sections 5-11 is requested.

The objections and rejections of the Office Action of October 13, 2009, having been obviated by amendment or shown to be inapplicable, withdrawal thereof is requested and passage of claims 1-4, 10-18, 24-32, and 38-43 to issue is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, reading "Francis J. Maguire". The signature is written in a cursive, flowing style with a large initial "F".

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